

ZIPHIUS CAVIROSTRIS CUVIER, 1823 (CETACEA, ZIPHIIDAE) ON THE BRAZILIAN COAST, WITH NOTES ON BIOMETRY

Regina Célia Zanelatto¹
Márcio Luiz Bittencourt²
Marco F. M. Corrêa¹
Lício George Domit³

ABSTRACT

A female of *Ziphius cavirostris* Cuvier, 1823 with 620 cm total length, stranded at Ponta do Cedro, Paranaguá Bay ($25^{\circ}20'38''S$ - $48^{\circ}19'42''W$), Paraná, Brazil, is recorded. External and skull measurements are provided. One fish, *Anchoa* sp., and scales of Engraulidae family were found in the stomach.

KEYWORDS. *Ziphius cavirostris*, biometry, Brazil.

INTRODUCTION

The Cuvier's beaked whale, *Ziphius cavirostris* Cuvier, 1823, is a cosmopolitan and pelagic species, distributed in almost all oceans, except in the Artic and Antarctic (PRADERI, 1971; KLINOWSKA, 1991). In the southwestern Atlantic Ocean the species was recorded in Uruguay (PRADERI, 1971; XIMENEZ et al., 1972; LICHTER, 1986) and Argentina (GOODAL, 1978; LICHTER, 1986). In the Brazilian coast, a female, 620 cm length, with a foetus, thought to be *Z. cavirostris*, was recorded on August, 1948 at Praia de Goes, Sto. Amaro Island, São Paulo (P.-DE-CARVALHO, 1969). Another female, 540 cm, with a foetus, was collected at Cabedelo, Paraíba in November, 1971 (CARVALHO, 1975). One male, with 400 cm (September, 1978), was identified by photography at Caieira beach, Fernando de Noronha Archipelago (LODI & FIORI, 1987). Also, some sightings have been registered in Cabedelo, Paraíba (ANTONELLE et al., 1987). There are records not published from the Rio Grande do Sul coast of an immature specimen, 273 cm (November, 1993), in the north of São José do Norte (Maria Cristina Pinedo and André S. Barreto, personal communication), and another based on a lower jaw (Eduardo R. Secchi and Alexandre N. Zerbini, personal communication). At Pontos de Pedra beach, in the northern region of Pernambuco State, one skeleton of an adult male was found (Roberval T. de Almeida, personal communication).

1. Centro de Estudos do Mar, Universidade Federal do Paraná, Caixa Postal 43, CEP 83255-000, Pontal do Sul, Paranaguá, Paraná, Brasil.

2. Nateec - Geologia e Saneamento, Av. Iguacú, 734 - Rebouças, CEP 80230-020, Curitiba, Paraná, Brasil.

3. Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis, Rua XV de Novembro, 18 CEP 83203-010, Paranaguá, Paraná, Brasil.

Despite the records of this species along the Brazilian coast, no biometric measurements were registered before. This is the first record to present biometrical information concerning the species along the Brazilian coast, with notes on feeding habits.

MATERIAL AND METHODS

The present record is based on the carcass of an adult female found on May 8, 1991 in a sandy beach near Ponta do Cedro, Ilha do Mel, Paraná State, Brazil ($25^{\circ}20'38''S$ - $48^{\circ}19'42''W$). The specimen was identified based on morphological characteristics of the body, the shape of the skull and the jaw with two alveoli in terminal position. Body and skull measurements were taken according to NORRIS (1961) and MOORE (1963). The measurements of the body (cm) were taken in a straight line from tip to tip and skull measurements (mm) were taken with a drawing-compass. The skull, jaws, and an incomplete post-craniial skeleton was collected including: right flipper, 4 cervical vertebra, 2 lumbar vertebra, the hyoids (incomplete), 8 ribs, one pelvic bone and some bones of the left pectoral fin were deposited in the Marine Mammals collection at the Museum of Centro de Estudos do Mar (MCEM 35), in Pontal do Sul, Paraná State.

The stomach content was filtered using a 0.2 mm mesh size nylon net. The fishes and scales were identified according to FISHER (1978) and compared with previously identified anchovie's scales. This material was deposited at the marine mammal laboratory at MCEM.

RESULTS AND DISCUSSION

Morphological characteristics. The body color was dark on the dorsal region and flanks, and lighter on the head and ventral side, similar to that described by LEATHERWOOD et al. (1982) and PINEDO et al. (1992). Body and skull measurements (tables I and II). Parallel scars with a maximum length of 50 cm were observed on the back and more abundantly on the flanks. These marks could be made by other odontocets (ROSS, 1984), probably due to inter- or intraspecific origin (LEATHERWOOD & REEVES, 1983; HEYNING, 1989). White oval patches were visible and concentrated on the postero-dorsal region, even though they were present all over the body (fig. 1). GOODAL (1978), RODRIGUEZ (1988) and LEATHERWOOD et al. (1976) recorded a similar distribution of patches in other specimens. Similar spots were described by JONES (1971) as crater wounds, probably as the result of bites by the cookie-cutter shark, *Isistius brasiliensis* (Quoy & Gaimard, 1824) but HEYNING (1989) reported them as parasite scars. Circular scars with a mean diameter of 5 cm were observed on the head, flanks and flukes. Diameters between 1.2 cm and 7 cm were previously cited by JONES (1971). MITCHELL & HOUCK (1967) recorded scratches and oval marks in males and females, even though they may be absent in some female specimens (OMURA et al., 1955).

Flukes with two perforations, the first in the right postero-lateral margin and the second one, of similar size, in the left postero-lateral margin, beside a poorly defined medium groove. Three small notches, two of which on the right postero-lateral margin and the other in the middle of the left postero-lateral margin (fig. 2). Flippers of small size, approximately 10% of the total length. Digital formula: I: 1; II: 6; III: 6; IV: 7 and V: 2. Dorsal fin falcated and placed behind the middle of the back, as cited by HEYNING (1989). Two typical ziphid "V" - shaped grooves underside the throat.

The pair of cylindrical teeth, as described by MOORE (1968), were not eclosed. Both teeth had conical tips and the pulpar cavity completely closed. The alveoli were

Table I. External measurements of *Ziphius cavirostris*, collected at Ponta do Cedro, Paranaguá Bay, Paraná, Brazil, on 08.V.1991, in centimeters (Measured after NORRIS (1961), modified).

Measurements	cm	% of total length
Total length, tip of upper jaw to flukes notch	620.0	100.0
Length from tip of upper jaw to center of eye	80.0	12.9
Length of gape	50.0	8.0
Distance from tip of upper jaw to ear	95.0	15.3
Distance from center of eye to external auditory meatus	15.0	2.4
Distance from angle of gape to center of eye	40.0	6.4
Distance from blowhole to center of eye	47.0	7.5
Distance from tip of upper jaw to center of blowhole	7.6	12.2
Distance from tip of upper jaw to anterior insertion of flipper	132.0	21.2
Distance from tip of upper jaw to dorsal fin base	405.0	65.3
Distance from tip of upper jaw to midpoint of umbilicus	367.0	59.1
Distance from tip of upper jaw to beginning of genital opening	385.0	62.0
Distance from tip of upper jaw to beginning of anus	425.0	68.5
Girth, on a transverse plane intersecting axila	340.0	54.8
Girth, maximum	310.0	50.0
Girth, on a transverse plane intersecting the anus	210.0	33.8
Greatest width of flukes (tip to tip)	170.0	27.4
Distance from flukes base to noch	53.0	8.5
Lenght of flipper (anterior insertion to tip)	60.0	9.6
Greatest width of flipper	30.0	4.8
Height of dorsal fin (from the tip to base)	30.0	4.8
Length of dorsal fin base	50.0	8.0
Length of genital opening	45.0	7.2
Height of flukes peduncle	30.0	4.8
Distance from posterior insertion of genital aperture to flukes notch	190.0	30.6
Distance between the mammary glands slits	22.0	3.5

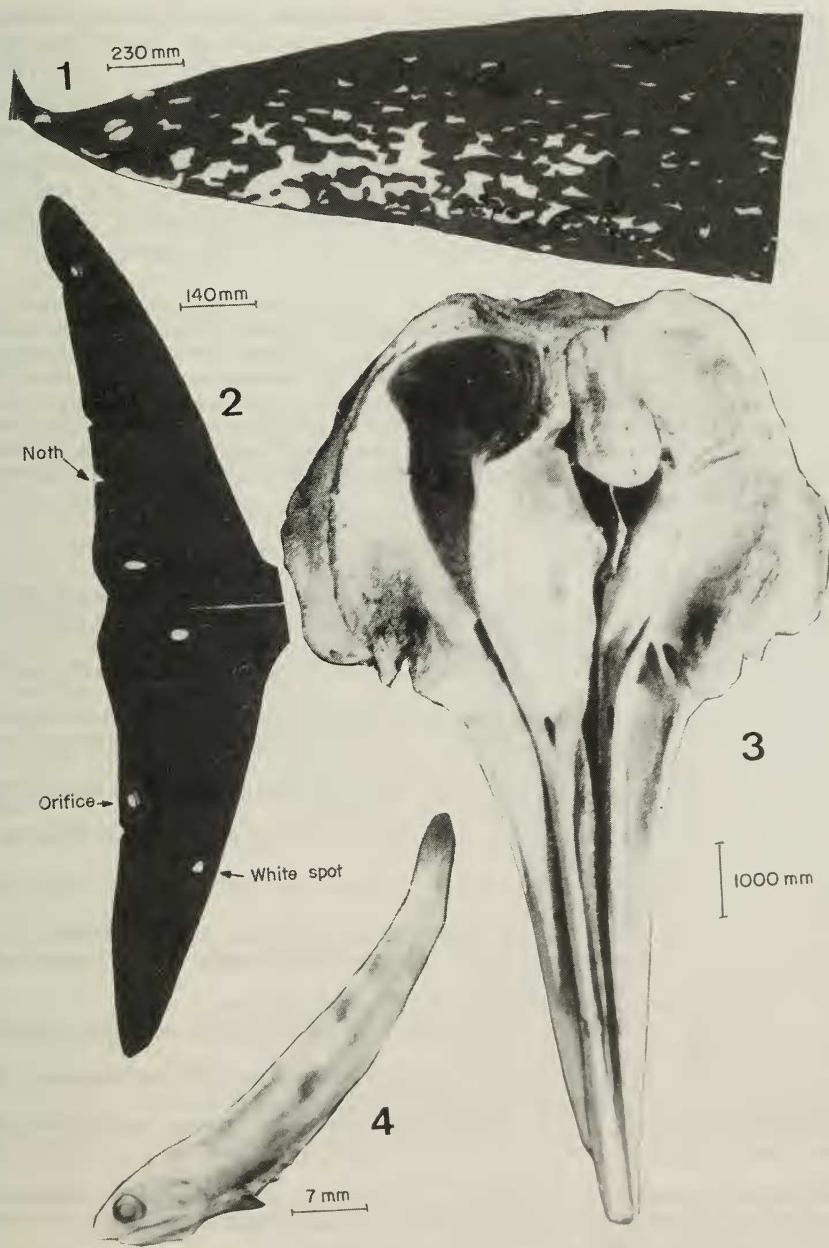
positioned on the tip of the lower jaws. Mandibular siphysis well fused with the well developed alveoli as described by ROSS & TIETZ (1972).

Well developed skull vertex (fig. 3), as described by MOORE (1968), with a nasal depression and a slight mesorostral ossification, typical of adult females (TRUE, 1910). FRASER (1942) described a well developed mesorostral ossification on the skull of a juvenile, while the pulpar cavity of the teeth was opened. A medium groove in the supr-occipital scute was also observed by MITCHELL & HOUCK (1967) which is dorsally developed up to the foramem magnum. Skull sutures not well fused, differing from a previous female record (TRUE, 1910). The few collected vertebra had their epiphysis and sutures well closed. All the morphological characteristics formerly described are typical of an adult female.

Comments on feeding habits. The stomach content had a 5.75 cm long anchovy *Anchoa* sp. (Osteichthyes, Engraulidae) (fig. 4), plus a partially digested specimen of *Lycengraulis grossidens* (Agassiz, 1829) and scales. The last ones were identified: *L. grossidens* (4 scales), *Anchoa spinifer* (Valenciennes, 1848) (2), *A. filifera* (Fowler, 1915) (2), *Anchoa* sp. (2), and *Cetengraulis edentulus* (Cuvier, 1828) (3). There were also vegetal debris, one small piece of charcoal (3.5mm of diameter) and several nematodes (Ascharoidea). No otholiths were found.

Table II. Skull measurements of *Ziphius cavirostris*, collected at Ponta do Cedro, Paranaguá Bay, Paraná, Brazil, on 08.V.1991, in millimeter (Measured after MOORE (1963), modified)

Measurements	mm	% of total length
Condylar basal length	933.0	100.0
Length rostrum, tip of beak to line connecting apices of antorbital notches	592.0	63.4
Tip of rostrum to posterior margin of pterygoid nearest mid-sagittal plane	739.0	79.2
Tip of rostrum to most posterior extension of wing of pterygoid (right)	775.2	83.0
Tip of rostrum to most anterior extension of pterygoid	491.0	52.6
Tip of rostrum to most posterior extension of maxillaries between the pterygoids on the palate	555.0	59.4
Tip of rostrum to most posterior extension of maxillary plate	852.0	91.3
Tip of rostrum to anterior margin of superior nares	664.0	71.1
Greatest length (horizon) of temporal fossa (right)	150.0	16.0
Greatest height (vertical) of temporal fossa (right)	093.5	10.0
Greatest length of orbit (right)	132.0	14.1
Greatest length of right nasal on vertex of skull	132.4	14.1
Length of nasal suture	128.0	13.7
Greatest breadth of skull across postorbital processes of frontals	555.7	59.5
Greatest breadth of skull across zygomatic processes of squamosals (ventral view)	525.8	56.3
Greatest breadth of skull across centers of orbits	551.0	59.0
Least breadth of skull across posterior margins of temporal fossae (posterior view)	341.0	36.5
Greatest distance of occipital condyles	175.0	18.7
Greatest width of an occipital condyle (right)	065.3	06.9
Greatest height of occipital condyle (right)	105.0	11.2
Greatest breadth of foramen magnum	52.6	5.6
Greatest breadth of nasals on vertex	75.0	8.0
Greatest width of premaxillae anterior to superior nares	210.0	22.5
Width of premaxillae at midlength of rostrum	57.6	6.1
Width of premaxillae in front of premaxillary foramina	90.0	9.6
Width of rostrum in apices of antorbital notches	405.0	43.4
Width of rostrum in apices of prominential notches	324.0	34.7
Width of rostrum at midlength	111.0	11.8
Height of rostrum at midlength	86.0	9.2
Greatest height of skull. Distance between vertex of skull and most ventral point on pterygoids	470.0	50.3
Greatest length of vomer visible at surface of palate	674.0	72.2
Greatest length of tympanic bulla (left)	73.0	7.8
Length of mandibular ramus	844.0	90.4
Length of mandibular symphysis	172.0	18.4
Distance from anterior end of mandible to anterior lip of alveolus (right)	10.5	1.1
Distance from anterior end of mandible to posterior lip of alveolus (right)	28.5	3.5
Distance from anterior end of mandible to coronoid process	765.0	82.0
Height of mandible at coronoid process	170.0	18.2
Length of tooth (right)	48.4	5.1
Length of tooth (left)	47.5	5.0
Greatest diameter of tooth (right)	12.0	1.2
Greatest diameter of tooth (left)	11.5	1.2
Most posterior point on condyle to most posterior point on symphysis	694.0	74.3
Most posterior point on condyle to most posterior point on alveolus	822.0	88.1
Height of alveolus (right)	19.0	2.0
Height of alveolus (left)	18.0	1.9
Breadth of alveolus (right)	19.0	2.0
Breadth of alveolus (left)	18.0	1.9
Breadth of jaws across mandibular condyles	511.5	54.8



Figs. 1-4. *Ziphius cavirostris*: 1, postero-ventral region showing the concentration of white oval patches; 2, shape of the flukes; 3, dorsal view of the skull; 4, *Anchoa* sp., found in the stomach of the specimen stranded at Ponta do Cedro, Ilha do Mel, Paraná State, Brazil.

Information on the feeding biology of *Z. cavirostris* is provided for the first time in the South Atlantic. Previous records showed that this species feeds mainly upon squids and demersal fishes (MITCHELL & HOUCK, 1967; CORNADO, 1971; NISHIWAKI & OGURO, 1972; MITCHELL, 1975; LEATHERWOOD et al. 1976; LEATHERWOOD et al. 1982; LEATHERWOOD & REEVES, 1983; ROSS, 1984; HOYT, 1984; HEYNING, 1989). Considering that those feeding items were not found in the stomach, it is difficult to know if the species actually consumed estuarine fishes, or it was only a circumstantial occurrence. Based on the remains found in the stomach of *Z. cavirostris* we can suggest that it may also feed in coastal or estuarine environments.

Acknowledgments. To H. P. Castello (MACN), P. C. Simões- Lopes (Lamaq-UFSC) and P. da C. Lana (CEM-UFPR) for the correction and translation of the manuscript, A. Ximenez (Lamaq-UFSC), C. A. Borzone, T. Absher and A. S. Freire (CEM-UFPR) J. Mead (Smithsonian Institution) for suggestions. P. H. Lemos (CEM-UFPR) and J. Figueiredo (Museu de Zoologia-USP) for fish identification, P. Pinheiro (CEM-UFPR) for scales identifications, N. Yoneda for the photograph of *Anchoa* sp., and A. Feijó for the drawings. J. C. Luiz and H. de Ramos (IBAMA/PR-Brazil) by provided technical support. World Wild Fundation (BSB-Brazil), White Martins (PR-Brazil), Unipac (SP-Brazil), Madepar Laminados (SP-Brazil), Cryometal S/A (MG-Brazil), and Refrigeração Paraná S/A for support of the laboratory. The help of the collaborators of the Marine Mammals Lab was greatly appreciated.

REFERENCES

- ANTONELLE, H. H.; LODI, L. & BOROBIA, M. 1987 Avistagens de cetáceos no período de 1980 a 1985 no litoral da Paraíba, Brasil. In: REUNIÃO DE TRABALHO DE ESPECIALISTAS EM MAMÍFEROS AQUÁTICOS DA AMÉRICA DO SUL, 2, Rio de Janeiro, 4-8 agosto. Anais, p. 114.
- CARVALHO, C. T. de. 1975. Ocorrências de mamíferos marinhos no litoral do Brasil. Bolm téc. Inst. Flor., São Paulo, **16**: 13-32.
- CORNADO, S. F. 1971. Dados biométricos y morfológicos del *Ziphius cavirostris* Cuv, hallado en la playa de Badalona, prov. de Barcelona España, el día 20 de marzo de 1970. Cetacea, Ziphiidae. Misc. Zool., Barcelona, **3** (1): 1-7.
- FISCHER, W. 1978. FAO species identification sheets for fishery purposes Western Central Atlantic (Fishing Area 31). Roma, FAO, 1-7, vp.
- FRASER, F. C. 1942. The mesorostral ossification of *Ziphius cavirostris*. Proc. zool. Soc. Lond. Ser. B, London, **112** (1/2): 21-30.
- GOODAL, R. N. P. 1978. Report on the small cetaceans stranded on the coasts of Tierra del Fuego. Sci. Rep. Whales Res. Inst., Tokio, **30**: 197-230.
- HEYNING, J. E. 1989. Cuvier's beaked whale *Ziphius cavirostris* G. Cuvier, 1823: In: RIDGWAY, S. H. & HARRISON, R. J. eds. Handbook of Marine Mammals. River Dolphins and the Larger Toothed Whales. London, Academic v. 4, p. 289-308.
- HOYT, E. 1984. The whale watcher's handbook. Toronto, A. P. Madison 208 p.
- JONES, E. C. 1971. *Isistius brasiliensis*, a squaloid shark, the probable cause of crater wounds on fishes and cetaceans. Fish. Bull., Hawaii, **69** (4): 791-798.
- KLINOWSKA, M. 1991. Dolphins, porpoises and whales of the world. In: IUCN Red Data Book. Gland, International Union for Conservation of Nature and Natural Resources. p. 317-319.
- LEATHERWOOD, S.; CADWELL, D. K. & WINN, H. E. 1976. Whales, dolphins, and porpoises of the western north Atlantic. A guie to their identification. Seattle, NOAA Tech. Rep. Circ., NMFS, n. 396, 176 p.
- LEATHERWOOD, S.; REEVES, R. R.; PERRIN, W. F. & EVANS, W. E. 1982. Whales, dolphins, and porpoises of the eastern north Pacific and adjacent Artic waters. A guie to their identification. Seattle, NOAA Tech. Rep. Circ., NMFS, n. 444, 245 p.
- LEATHERWOOD, S. & REEVES, R. R. 1983. The Sierra Club Handbook of Whales and Dolphins. San Francisco, Sierra Club Books. 302 p.
- LICHTER, A. A. 1986. Records of beaked whales (Ziphiidae) from the western south Atlantic. Sci. Rep.

- Whales Res. Inst.**, Tokio, 37: 109-127.
- LODI, L. & FIORI, B. 1987. Observações sobre o comportamento do golfinho rotador *Stenella longirostris* (Cetacea, Delphinidae) na Ilha de Fernando de Noronha - Brasil. In: REUNIÃO DE TRABALHO DE ESPECIALISTAS EM MAMÍFEROS AQUÁTICOS DA AMÉRICA DO SUL, 2, Rio de Janeiro, 4-8 agosto. Anais, p. 60-68.
- MITCHELL, E. 1975. Report of the meeting on smaller cetaceans. **J. Fish. Res. Bd Can.**, Montreal, 32 (7): 889-983.
- MITCHELL, E. & HOUCK, W. J. 1967. Cuvier's beaked whale (*Ziphius cavirostris*) stranded in northern California. **J. Fish. Res. Bd Can.**, Ottawa, 24 (12): 2503-2513.
- MOORE, J. C. 1963. Recognizing certain species of beaked whales of the Pacific Ocean. **Am. Midl. Nat.**, Chicago, 70 (2): 396-428.
- . 1968. Relationships among the living genera of beaked whales with classifications, diagnoses and keys. **Fieldiana, Zool.**, Chicago, 53 (4): 209-298.
- NISHIWAKI, M. & OGURO, N. 1972. Catch of the Cuvier's beaked whale off Japan in recent years. **Sci. Rep. Whales Res. Inst.**, Tokio, 24: 35-41.
- NORRIS, K. 1961. Standardized methods for measuring and recording data on smaller cetaceans. **J. Mammal.** Los Angeles, 42 (4): 471-476.
- OMURA, H.; FUJINO, K. & KIMURA, S. 1955. Beaked whale *Berardius bairdi* of Japan, with notes on *Ziphius cavirostris*. **Sci. Rep. Whales Res. Inst.**, Tokio, 10: 89-132.
- PAIVA-DE-CARVALHO, J. 1969. Sobre a provável ocorrência da "baleia de Cuvier" no litoral de São Paulo. **Revta. Nac. Pesca.**, São Paulo, 10 (82): 8-11.
- PINEDO, M. C.; ROSAS, F. C. W. & MARMONTEL, M. 1992. **Cetáceos e pinípedes do Brasil**. Uma revisão dos registros e guia para identificação das espécies. Manaus, UNEP-FUA, 213 p.
- PRADERI, R. 1971. Sobre la presencia de *Ziphius cavirostris* G. Cuvier (Cetacea, Hyperoodontidae), en las costas uruguayas de Río de La Plata. **Boln Soc. Zool. Uruguay**, Montevideo, 1:52-54.
- RODRIGUEZ, M. P. 1988. Reporte de algunos cetáceos del Caribe Colombiano. **Boln Fac. Biol. Mar.**, Bogotá, 8: 30-40.
- ROSS, G. J. B. 1984. The smaller cetaceans of the south east coast of southern Africa. **Ann. Cape Prov. Mus. (Nat. Hist.)**, Cape Town, 15: 173-410.
- ROSS, G. J. B. & TIETZ, R. M. 1972. Record of Cuvier's beaked whale, *Ziphius cavirostris* from southern Africa. **Ann. Cape Prov. Mus. (Nat. Hist.)**, Cape Town, 9:1-10.
- TRUE, F. W. 1910. An account of the beaked whales of the family Ziphidae in the collection of the U.S. National Museum. **Bull. U. S. natn. Mus.**, Washington, 73: 1-89.
- XIMENEZ, A.; LANGGUTH, A. & PRADERI, R. 1972. Lista sistemática de los mamíferos del Uruguay. **Ann. Mus. Nac. Hist. Nat.**, Montevideo, 7 (5): 1-45.